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Prepared for

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Two papers describing research dealing with the analysis of reliability data were written during the past year and are to be published. Another has been written and submitted for publication, two others were revised for publication, and another was published. Several invited presentations were made at scientific meetings.

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The paper, "Sampling Plans for the Two-Parameter Weibull Distribution with Unknown Parameters," was published in *Technometrics*.

The paper describing tests for Weibull outliers that can be used to identify treatment effects was revised for publication in a volume being edited by Professor Jagdish Rustagi and Professor Stelios Zanakis. The volume is devoted to *Optimization in Statistics* and is to be published by North Holland in the series of TIMS Studies in the Management Sciences.

The study on goodness-of-fit tests for Weibull versus lognormal alternatives has been extended to include lognormal hypotheses versus Weibull alternatives. The Monte Carlo analysis has been completed, and a paper describing the results is being put into final form.

Investigation involving quantile estimation of the Weibull shape parameter for cases in which three parameters are unknown has been made with Professor Stelios Zanakis of West Virginia College of Graduate Studies. An expression for the asymptotic variance of a proposed asymptotically unbiased three-order-statistic estimator was derived, and this expression was used to find the three sample quantiles that minimize the asymptotic variance as a (very insensitive) function of the unknown shape parameter only.

A Monte Carlo study that uses these results demonstrates that for moderate sample sizes, an estimator based on the first, last, and one other (early) order statistic provides both nearly zero bias and nearly minimal variance. For shape parameter values of unity or less, the estimator is about as efficient as the maximum-likelihood estimator.

Preliminary results were written up for an invited presentation at the national meeting in November, 1980 of the Institute for Decision Sciences and for publication in the proceedings of that meeting. A version incorporating additional results has been submitted for journal publication.

An article on life testing was written with Prof. N.D. Singpurwalla
for publication in a volume of *The Encyclopedia of Statistical Sciences*,
edited by N.L. Johnson and Samuel Kotz and to be published by John Wiley
and Sons. This article and one on extreme-value distributions, also
written with Professor Singpurwalla for publication in an (alphabetically)
earlier volume of the encyclopedia, were published as Rockwell Science
Center Technical Reports and distributed to those on the ONR Assurance
Sciences distribution list. Galley proofs of the article on extreme
values were corrected, and work was begun on a third encyclopedia article
on the Mann-Grubbs method for obtaining confidence bounds on system
reliability.

The paper on use of Reliability methodology to analyze habitual
behavior in U.S. military personnel was presented at the annual TIMS/ORSA
meeting in 1980.

The paper, "Weibull Prediction Intervals for Finite Lots When
Testing Occurs at Stress Levels Other Than Nominal," has been accepted
for publication in *Technometrics*, subject to revision. The revision
has been completed and submitted to the editor.

Work is currently proceeding on evaluation and tabulation of
constants that will allow for determination of confidence bounds on
exponential parameters from time-censored data. The problem of obtaining
such confidence bounds is a classical one, and one which publication
of the necessary constants will make tractable. The results of this
research were presented at an invited talk given at an Institute for
Mathematical Statistics (I.M.S.) Special Topics Conference on Survival
Analysis in October, 1981, at Ohio State University. The proceedings
of that meeting will be published in the I.M.S. Monograph Series and
will contain results obtained as of this date. The results have been
written and submitted. Further research involves simulation and
smoothing techniques, and more extensive tabulations will be submitted
for publication.

Immediately following the meeting at Ohio State University, the
results obtained on Weibull outliers were given as an invited presentation
at Gatlinburg, Tennessee, at the Fall Technical Conference, sponsored
by the American Society for Quality Control and the Section on Physical
and Engineering Sciences of the American Statistical Association. This
topic (Weibull outliers) was discussed also in 1980 as an invited
presentation at an I.M.S. regional meeting held at the University of
California at Davis.